

CLAIMS

1. A multi-speed ratio apparatus to control output comprising:
a rotary speed converter having at least three rotatable components being operably connected together;
a component of said at least three rotatable components being an input part to said rotary speed converter;
another component of said at least three rotatable components being an output part of said rotary speed converter; and
a grounding member operably connected to at least one of said at least three rotatable components for selectively grounding said at least one of said at least three rotatable components.
2. The apparatus as defined in claim 1 further comprising a housing.
3. The apparatus as defined in claim 2 wherein said groundable component of said at least one of said at least three rotatable components being grounded to said housing.
4. The apparatus as defined in claim 1 wherein at least one of said at least three rotatable components comprises either an

inner cam, a reaction disk, or an outer cam.

5. The apparatus as defined in claim 1 wherein said at least three rotatable components comprise an inner cam, a reaction disk and an outer cam; further comprising:

a plurality of slots in said reaction disk; and

a contact member selectively disposed within at least one of said plurality of slots.

6. The apparatus as defined in claim 5 wherein said contacting member comprises a roller.

7. The apparatus as defined in claim 5 wherein said contacting member comprises a bearing.

8. The apparatus as defined in claim 5 wherein said contacting member comprises a roller device.

9. The apparatus as defined in claim 1 wherein:

said input part being an inner cam;

said output part being a reaction disk; and

said groundable component of said at least one of said at least three rotatable components being an outer cam.

10. The apparatus as defined in claim 1 wherein:

said input part being a reaction disk;

said output part being an inner cam; and

said groundable component of said at least one of said at least three rotatable components being an outer cam.

11. The apparatus as defined in claim 1 wherein:

said input part being an outer cam;

said output part being an inner cam; and

said groundable component of said at least one of said at least three rotatable components being a reaction disk.

12. The apparatus as defined in claim 1 wherein:

said input part being an inner cam;

said output part being an outer cam; and

said groundable component of said at least one of said at least three rotatable components being a reaction disk.

13. The apparatus as defined in claim 1 wherein:

said input part being a reaction disk;

said output part being an outer cam; and

said groundable component of said at least one of said at least three rotatable components being an inner cam.

14. The apparatus as defined in claim 1 wherein:

said input part being an outer cam;

said output part being a reaction disk; and

said groundable component of said at least one of said at least three rotatable components being an inner cam.

15. The apparatus as defined in claim 1 wherein said at least three rotatable components of said rotary speed converter comprises a nested configuration.

16. The apparatus as defined in claim 15 wherein at least one of said at least three rotatable components comprise either one of an inner cam, a reaction disk, or an outer cam.

17. The apparatus as defined in claim 15 wherein:

said input part being an inner cam;

said output part being a reaction disk; and

said groundable component of said one of said at least three rotatable components being an outer cam.

18. The apparatus as defined in claim 15 wherein:

said input part being a reaction disk;

said output part being an inner cam; and

said groundable component of said at least one of said at

least three rotatable components being an outer cam.

19. The apparatus as defined in claim 15 wherein:

said input part being an outer cam;

said output part being an inner cam; and

said groundable component of said at least one of said at least three rotatable components being a reaction disk.

20. The apparatus as defined in claim 15 wherein:

said input part being an inner cam;

said output part being an outer cam; and

said groundable component of said at least one of said at least three rotatable components being a reaction disk.

21. The apparatus as defined in claim 15 wherein:

said input part being a reaction disk;

said output part being an outer cam; and

said groundable component of said at least one of said at least three rotatable components being an inner cam.

22. The apparatus as defined in claim 15 wherein:

said input part being an outer cam;

said output part being a reaction disk; and

said groundable component of said at least one of said at

least three rotatable components being an inner cam.

23. The apparatus as defined in claim 1 wherein said rotary speed converter comprises a conjugate pair of rotatable parts.

24. The apparatus as defined in claim 23 wherein at least one of said at least three rotatable components comprise either an inner cam, a reaction disk, or an outer cam.

25. The apparatus as defined in claim 23 wherein:

said input part being an inner cam;

said output part being a reaction disk;

said groundable component of said at least one of said at least three rotatable components being an outer cam; and
said inner cam and said outer cam being conjugate.

26. The apparatus as defined in claim 23 wherein:

said input part being a reaction disk;

said output part being an inner cam;

said groundable component of said at least one of said at least three rotatable components being an outer cam; and
said inner cam and said outer cam being conjugate.

27. The apparatus as defined in claim 23 wherein:

said input part being an outer cam;
said output part being an inner cam;
said groundable component of said at least one of said at
least three rotatable components being a reaction disk; and
said inner cam and said outer cam being conjugate.

28. The apparatus as defined in claim 23 wherein:

said input part being an inner cam;
said output part being an outer cam;
said groundable component of said at least one of said at
least three rotatable components being a reaction disk; and
said inner cam and said outer cam being conjugate.

29. The apparatus as defined in claim 23 wherein:

said input part being a reaction disk;
said output part being an outer cam;
said groundable component of said at least one of said at
least three rotatable components being an inner cam; and
said inner cam and said outer cam being conjugate.

30. The apparatus as defined in claim 23 wherein:

said input part being an outer cam;
said output part being a reaction disk;
said groundable component of said at least one of said at

least three rotatable components being an inner cam; and
said inner cam and said outer cam being conjugate.

31. The apparatus as defined in claim 1 wherein said input part being operably connected to a driving member.

32. The apparatus as defined in claim 31 wherein the driving member comprises an engine.

33. The apparatus as defined in claim 31 wherein the driving member comprises a motor.

34. The apparatus as defined in claim 31 wherein the driving member comprises a transmission.

35. The apparatus as defined in claim 31 wherein said driving member comprises another rotary speed converter.

36. The apparatus as defined in claim 1 wherein said output part being operably connected to a drivable member.

37. The apparatus as defined in claim 36 wherein said drivable member being another rotary speed converter.

38. The apparatus as defined in claim 36 wherein the drivable member comprises a differential.

39. The apparatus as defined in claim 38 further comprises a housing and said differential being contained in said housing.

40. The apparatus as defined in claim 1 which is back drivable.

41. The apparatus as defined in claim 1 which is non-back drivable.

42. The apparatus as defined in claim 5 wherein said reaction disk being nested between said conjugate pair of cam parts.

43. The apparatus as defined in claim 1 wherein said grounding member comprises a frictional member.

44. The apparatus as defined in claim 1 wherein said grounding member comprises a brake element.

45. The apparatus as defined in claim 1 wherein said grounding member comprises a clutch.

46. A speed converter for producing rotary motion of a shaft,

comprising:

a housing;

a single stage rotary speed converter having a conjugate pair of cam parts and a reaction disk operably interconnected between said conjugate pair of cam parts, said single stage rotary speed converter being contained within said housing;

a part of said conjugate pair of cam parts comprising an inner cam and an input shaft, said inner cam being drivable by a driving member capable of producing a predetermined input rotary speed;

another part of said conjugate pair of cam parts comprising an outer cam;

said reaction disk includes slots and an output shaft, said reaction disk being capable of operably coupling said conjugate pair of cam parts, wherein said output shaft being capable of a predetermined output rotary speed and further being capable of driving a drivable member;

a contact member selectively disposed within at least one said slots; and

a grounding member operably connected to said outer cam and capable of selectively grounding said outer cam to said housing.

47. A speed converter for producing rotary motion of a shaft, comprising:

a housing;

a single stage rotary speed converter having a conjugate pair of cam parts and a reaction disk operably interconnected between said conjugate pair of cam parts, said single stage rotary speed converter being contained within said housing;

a part of said conjugate pair of cam parts comprising an inner cam and an output shaft, said output shaft capable of having a predetermined output rotary speed and further being capable of driving a drivable member;

another part of said conjugate pair of cam parts being an outer cam;

said reaction disk includes slots and an input shaft, said slotted reaction disk being capable of operably coupling said conjugate pair of cam parts, wherein said reaction disk being drivable by a driving member capable of having a predetermined input rotary speed;

a contact member selectively disposed within at least one said slots; and

a grounding member operably connected to said outer cam and

capable of selectively grounding said outer cam to said housing.

48. A speed converter for producing rotary motion of a shaft comprising:

a housing;

a single stage rotary speed converter having a conjugate pair of cam parts and a reaction disk operably interconnected between said conjugate pair of cam parts, said single stage rotary speed converter being contained within said housing;

a part of said conjugate pair of cam parts comprising an inner cam and an output shaft, wherein said output shaft being capable of having a predetermined output rotary speed and further being capable of driving a drivable member;

another part of said conjugate pair of cam parts being an outer cam;

said reaction disk includes slots and an input shaft, said slotted reaction disk being capable of operably coupling said conjugate pair of cam parts, wherein said reaction disk can being drivable by a driving member capable of producing a predetermined input rotary speed;

a contact member selectively disposed within at least one of said slots; and
a grounding member operably connected to said outer cam and capable of selectively grounding said outer cam to said housing.

49. A multi-ratio speed converter capable of being operably connected to a transmission, said multi-ratio speed converter comprising:

at least one single stage speed converter having a input cam, an output cam, a reaction disk, and a contact member, all being located on a common axis and being operably interconnected to each other;

said at least one single stage speed converter being disposed between the transmission and an axle;

said input cam and output cam being conjugate to each other;

said reaction disk having a plurality of slots each of said plurality of slots being capable of entraining said contact member therein;

said input cam being operably connected to the transmission;

said reaction disk being operably connected to the axle;
and

a grounding member operably connected to said outer cam capable of selectively grounding said outer cam, whereby a rotational speed applied to said at least one single stage speed converter by the transmission is capable of being converted to another rotational speed.

50. The converter as defined in claim 49 wherein said at least one single stage converter capable of being set to a predetermined speed ratio.

51. The converter as defined in claim 49 further comprising a plurality of said at least one single stage speed converters, each being operably connected to another and disposed between the transmission and the axle.

52. A multi-ratio speed transmission module comprising:
 at least one single stage speed converter having a input cam, an output cam, a reaction disk, and a contact member, all being located on a common axis and being operably interconnected with each other;
 said at least one single stage speed converter being disposed between a transmission and an axle;
 said input cam and output cam being conjugate to each

other;
said reaction disk having a plurality of slots, each of
said plurality of slots being capable of entraining
said contact member therein;
said input cam being operably connected to the
transmission;
said reaction disk being operably connected to the axle;
and
a grounding member operably connected to said outer cam
capable of selectively grounding said outer cam,
whereby a rotational speed applied to said at least one
single stage speed converter by the transmission is
capable of being converted to another rotational
speed.

53. A multi-ratio speed transmission comprising:

at least one single stage speed converter having a input
cam, an output cam, a reaction disk, and a contact
member, all being located on a common axis and being
operably interconnected with each other;
said at least one single stage speed converter being
disposed between a power source and an axle;
said input cam and output cam being conjugate to each
other;

said reaction disk having a plurality of slots, each of
said plurality of slots being capable of entraining
said contact member therein;
said input cam being operably connected to the power
source;
said reaction disk being operably connected to the axle;
and
a grounding member operably connected to said outer cam
capable of selectively grounding said outer cam,
whereby a rotational speed applied to said at least one
single stage speed converter by the power source is
capable of being converted to another rotational
speed.

54. A transmission comprising:

at least one rotary speed converter having at least three
rotatable components;
a component of said at least three rotatable components
being an input to said at least one rotary speed
converter;
another component of said at least three rotatable
components being an output of said at least one rotary
speed converter; and
a grounding member operably connected to at least one of

said at least three rotatable components for selectively grounding said at least one of said at least three rotatable components.

55. A differential comprising:

at least one rotary speed converter having at least three rotatable components;

a component of said at least three rotatable components being an input to said at least one rotary speed converter;

another component of said at least three rotatable components being an output of said at least one rotary speed converter; and

a grounding member operably connected to one of said at least three rotatable components for selectively grounding said at least one of said at least three rotatable components.

56. The apparatus as defined in claim 1 operably connected to a differential within a common housing.